

# The Bacteriology of the Eyelids.

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Reprinted from the Transactions of the Section on Ophthalmology  
of the American Medical Association, 1906.

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CHICAGO :  
PRESS OF THE AMERICAN MEDICAL ASSOCIATION,  
ONE HUNDRED AND THREE DEARBORN AVENUE,  
1906.



# THE BACTERIOLOGY OF THE EYELIDS.

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In considering the bacteriology of the eyelids it is important to remember that we are dealing with structures which, from their anatomic peculiarities and from their situation, are subject to a large number of pathologic processes.

We have first a covering of skin exceedingly thin in texture and bound down but loosely to an underlying tissue which is free from fat, thus presenting features which modify to a certain extent the course and picture of certain affections when they occur in this region, as seen, for instance, in the marked swelling which follows a trivial infection. Secondly, we have the ciliary border, covered with a modified skin, with its hair follicles, sebaceous glands, sweat glands and large vascular supply. Thirdly, the large meibomian glands enclosed in a thick fibrous envelope, the tarsus.

The situation of the lids is rich in its pathologic possibilities, no bar is offered to the direct extension of disease from the cheeks, forehead and temporal regions, the tear passages offer an open route from the nose; internally the conjunctiva and cornea are in close contact while the bony structures of the orbit and the accessory sinuses of the nose are but little removed. In the lids, as well as in all other regions where the skin and its appendages are present, the ordinary pyogenic cocci occupy the center of the stage as the primary cause of infections or as secondary invaders in the lesions of other processes.

## FURUNCLE.

Pasteur's observations on the causation of furuncle by virulent staphylococci have been confirmed by many

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\* Read in the Section on Ophthalmology of the American Medical Association, at the Fifty-seventh Annual Session, June, 1906.

observers. This affection is not very common on the lids and when present is most often seen in the region of the eyebrow. When it reaches the lid border it receives the name of hordeolum. Furuncle originates from the infection of a hair follicle, sebaceous gland or possibly a sweat gland, by a pus-producing organism, usually the *staphylococcus aureus*. Various disorders of the system and of the skin may be predisposing factors.

#### ERYSIPELAS.

This process represents an infection of the skin with the streptococcus, as was established by Fehleisen. A lesion is considered indispensable, but can not always be demonstrated. The face is the seat of election and infection may take place in the nose or mouth, (for the streptococcus is not infrequently present in the upper air passages) or from a pre-existing process, such as a dacryocystitis or a hordeolum.

Erysipelas of the lids is most often secondary to facial erysipelas. Less frequently it is primary and then seldom remains limited, but invades neighboring parts. Both lids are infected as a rule; there is a very marked degree of swelling, which may close the eye for a number of days, the skin is tense, red and shiny, and, owing to its thinness, infection of the subcutaneous tissue is more likely to take place in this region than in others. Abscess formation is by no means rare, nor is gangrene; occasionally there is an extension of the process to the eyeball or to the orbit with destruction of the optic nerve by pressure, and finally there may be an involvement of the meninges and cerebral sinuses with a fatal outcome. However mild the process, a certain amount of conjunctival reaction is observed.

Occasionally erysipelas of the lids is seen in a low-grade form of long duration, with frequent recurrences, and this may lead to a permanent alteration in the structure of the lid, and to the formation of new spongy tissue. Such has been the origin of the cases reported as elephantiasis of the lid by Liebrecht,<sup>2</sup> Anderson Smith,<sup>3</sup> Pedraglia<sup>4</sup> and Deutsehmann,<sup>4</sup> Farreras,<sup>5</sup> Anderson Critchett,<sup>6</sup> Rombolotti<sup>7</sup> and others. Von Miehle<sup>8</sup> has seen impetiginous eczema, supervening on erysipelas of the lids, and obtained the streptococcus from the lesions.

## LID ABSCESS AND PHLEGMON.

Abscess formation is due in most cases to infection with the ordinary pyogenic cocci. Ogston examined the pus from 100 cases and found cocci in all the acute ones. Steinhaus analysed 330 cases of different observers and found in 66 per cent. staphylococci, in 20 per cent. streptococci and a mixture of the two forms in 9 per cent. Other organisms are rare. To the staphylococcus is commonly due the acute localized processes terminating in pus formation, while the streptococcus is more often concerned in the production of spreading inflammation such as phlegmonous cellulitis.

The bacteriology of abscesses and phlegmonous inflammations of the lids differs not at all from that in other localities. This is well illustrated in a small series of cases reported by Gallenga,<sup>9</sup> who observed, during the summer of 1904, and chiefly among poor people afflicted with various dermatoses, a large number of abscesses occurring on the lids and also on other parts of the body. In his series of twelve bacteriologic examinations he obtained the staphylococcus ten times and the streptococcus twice.

Among the etiologic factors leading to lid abscess, an infected wound is without doubt the most frequent; I have already spoken of furuncle and erysipelas. Caron de Villards<sup>10</sup> describes severe infections from the sting or bite of a large variety of insects and scorpions and in this connection Zia<sup>11</sup> reports the case of a child who developed a phlegmonous swelling of the lid due, the parents thought, to the bite of a fly. Under acute symptoms an abscess formed, accompanied by gangrene of the conjunctiva, extension to the orbit, meningitis, and death. An examination disclosed the *Staphylococcus aureus* in pure culture. Elschnig<sup>12</sup> and others mention as among the causes of lid phlegmon, extension of infection from neighboring parts as from an acute dacryocystitis, from orbital phlegmon, panophthalmitis with suppuration of the peribulbar tissue, periostitis and necrosis of the bony walls of the orbit and empyema of the accessory nasal sinuses. Fage<sup>13</sup> has seen orbital and palpebral abscesses from suppuration of the orbital process of the superior maxilla and Galezowski<sup>14</sup> has seen many similar cases. Ziem<sup>15</sup> reports an abscess in the lower lid of a child, extending from an antrum infected by a carious tooth socket. Occasionally infection of the

lid takes place from an acute conjunctivitis. Thus Fruginelli<sup>16</sup> reports an abscess following a pseudomembranous conjunctivitis from the membrane and pus of which the pneumococcus was cultivated. Fuchs<sup>17</sup> describes a severe lid swelling and gangrene of all four lids of a child, complicating gonorrheal conjunctivitis. Berger<sup>18</sup> and Elschmig<sup>12</sup> report lid abscesses following the same cause and both liken the process to the formation of a peri-urethral abscess in gonorrheal urethritis from the penetration of the organisms into the peri-urethral tissue. In opposition to this view, however, it must be urged that the gonococcus has never been found in a lid abscess, that the drainage of gonorrheal pus is far better cared for in the eye than in the urethra and the infection in these cases was very probably due to some ordinary coccus in a tissue of low vitality. Lid abscesses are not uncommonly observed in children during the first years of life to all appearances of spontaneous origin, but probably due to some unnoticed lesion or possibly to metastasis from some masked infection and resembling the "metastatic" affections of the eyeball of uncertain origin which are occasionally seen.

In connection with a number of general infectious diseases like the exanthemata, lid infections may occur. Such cases have been reported by Bock,<sup>19</sup> Landolt,<sup>20</sup> Wicherkiewicz,<sup>21</sup> Hosch<sup>22</sup> and others in influenza. In some cases the lid infections subside without suppuration, while in others they progress to abscess formation. Pfeiffer's bacillus has never been demonstrated as the cause. As early as 1794 Himly<sup>23</sup> saw phlegmon of the lids and gangrene in severe cases of typhoid and apparently no one has ever seen it since, though gangrene is not a rare sequel of typhoid and many parts of the body have been affected (Keen<sup>24</sup>). Jackson<sup>25</sup> describes lid abscess after scarlet fever in a case which also developed bronchopneumonia and an infection in the tibia. Landesberg<sup>26</sup> and others have seen it in smallpox. Elschmig<sup>12</sup> reports a lid phlegmon in a case of general infection and conversely Fraenkel<sup>27</sup> has observed a pyemia proceeding from this cause. Further observations will be found under their special headings, as gangrene, anthrax, actinomycosis, etc.

#### GANGRENE.

Gangrene of the lids, though not of common occurrence, can hardly be classed as rare. There is a large



literature on the subject, which can only in part be referred to here. Further references may be found in the articles of Roemer,<sup>28</sup> Pes<sup>29</sup> and Elschmig.<sup>12</sup> As will be seen, this process may be due to a number of different micro-organisms, though in but a small number of the cases has a bacteriologic examination been carried out; it may follow many diseased conditions of the body, it may occur in tissues from which the vitality has been sapped by some local cause.

Several factors are active in the production of a gangrenous process. First, micro-organisms, which are doubtless present and active at some stage of the process, and which may have the special qualities necessary to produce gangrene and necrosis of the tissues involved, as in the case of the anthrax bacillus; second, the task of the germ may be made easier by the diminished vitality of the tissue, be it by pressure caused by a marked swelling, by anemia due to the excessive application of cold, by destructive wounds or burns or by a weakened condition of the system as in the scrofulous and anemic children, general infections and diabetes. It is probably only in the gangrene of purely vascular origin, as in Raynaud's disease, that bacteria are unimportant. The anthrax bacillus in the past has probably been the most frequent cause of gangrene of the lids. These cases I exclude from consideration at present. Of the other micro-organisms the streptococcus is most often found, and a history of some form of trauma is usually given.

Of four of the cases collected by Pes, in which a bacteriologic examination was given, the streptococcus appeared three times and the staphylococcus once. In the first of Pes<sup>29</sup> cases infection was produced by an insect bite, there was a severe inflammation involving the whole side of the face and the neighboring glands; and the skin of the lids, with the exception of the ciliary margins, became gangrenous. Gangrene from insect bites was also observed in the tropics by Carron de Villards.<sup>10</sup> Other very trivial injuries will lead to gangrene. In Pes<sup>29</sup> second case the process started from a scratch caused by a hen's claw.

In Friedenwald's<sup>30</sup> case the original injury was a scratch, in Valude's<sup>31</sup> case a gangrenous phlegmon of the lids and orbit started from a small wound of the lid. In Giulini's<sup>32</sup> case the starting point was from a

lesion of impetiginous eezema. Baeilli and coeei were found. Gangrene due to the exeessive use of ice has been reported by Plauth.<sup>33</sup>

Gangrene following erysipelas has been observed several times and according to Weber<sup>34</sup> there are three forms, the first representing an essential erysipelatos gangrene of the skin in which small areas die from stasis and slough off; the second, a penetration of the streptococci into the deeper tissues leading to a complication of the skin infection by a cellulitis; the third, a slow, recurring form of long duration, which leads often to multiple abscesses, lowers the vitality of the skin and finally produces gangrene. Joss,<sup>35</sup> R. H. Derby<sup>36</sup> and Mitvalsky<sup>37</sup> have recorded cases of gangrene of the lids following erysipelas, in the latter's the streptococcus was cultivated.

Steffens<sup>38</sup> recovered the diphtheria bacillus from a gangrenous phlegmon of the lids, as did also Mori<sup>39</sup> and Yamamoto<sup>39</sup> and there are several other observations (Vix,<sup>40</sup> Randall,<sup>41</sup> Sehillinger<sup>42</sup>) where from the clinical course and microscope alone (?) the diagnosis was made. I would like to emphasize here the necessity of animal inoculation and the recovery of the germ in the exact diagnosis of this disease. At the Massachusetts Eye and Ear Infirmary, among over 20,000 new patients annually, diphtheria of the ocular structures is a very rare disease. In blennorrhoea neonatorum Fuch<sup>47</sup> has seen all four lids become gangrenous; Knies<sup>43</sup> has seen a similar process in measles. Castresana<sup>44</sup> and Goieechea<sup>44</sup> have also seen gangrene of the four lids (erysipelas).

Gangrene of the lids may also be caused by extension from neighboring inflammations. In Falko's<sup>45</sup> case, an extensive suppuration of the frontal sinus led to thrombosis of the superior orbital veins and cavernous sinus, gangrene of the lids and eyeball, meningitis and death.

In connection with general diseases, gangrene of the lids may result from typhoid and influenza, which have been mentioned in speaking of lid abscess. In scarlet fever it has been observed by St. Martin,<sup>46</sup> Jackson<sup>25</sup> and Kolle.<sup>47</sup> In measles, by Fieuzal<sup>43</sup> in three cases, by St. Martin<sup>49</sup> in one, and by Knies<sup>43</sup> in one. In 270 cases of smallpox Landesberg<sup>50</sup> observed phlegmon of the lids and gangrene in three. In variella, Roemer<sup>28</sup> gives the only instance and also a complete bacteriologic exami-



ation which showed the streptococcus and the *Bacillus proteus vulgaris*, the latter probably a contamination. Possibly this case may be classed under the rare disease known as *Dermatitis gangrenosum infantum* which occurs most frequently after varicella. In whooping cough there is an observation by Morax,<sup>51</sup> who obtained the streptococcus by culture. There are a number of observations on lid phlegmon and gangrene in general septic conditions. In Mitvalsky's<sup>37</sup> case there was a general septicemia arising from a suppurative process in the uterus and tubes. The streptococcus was found. In Joss's<sup>35</sup> case there was erysipelas and gangrene following a delayed delivery. Here also was the streptococcus (microscope). In diabetes, Lagrange has seen gangrene of the lids. Instances of gangrene of the lids of apparently spontaneous origin appear in the literature from time to time. Hilbert<sup>52</sup> in 1882, reported two such cases but in all probability they were due to infection (Roemer). Roemer<sup>28</sup> also disagrees with Kipp's<sup>53</sup> diagnosis of a gangrene due to a trophic neurosis produced by alcohol and regards infection as probable. Roger and Weil<sup>54</sup> report a case of gangrene of apparently spontaneous origin and benign course from which staphylococci were cultivated. Another observation is that of Marlow,<sup>55</sup> under the title of "Noma," which is interesting, as it suggests the question as to whether or not these apparently spontaneous cases in poorly nourished children have any connection with the true noma. Buday<sup>56</sup> in his recent article concludes that noma belongs to the so-called infectious gangrene, due to a variety of mouth bacteria, but most often to a symbiosis of a spirillum and the *Bacillus fusiformis*. The bacteriologic and histologic features are characteristic.

From the foregoing observations it seems probable that gangrene of the lids is due always to infection and that in the majority of cases the infecting agent can be demonstrated. Anthrax excluded, we have the streptococcus as the most frequent organism while the staphylococcus and the diphtheria bacillus occasionally occur. Doubtless in the future many other bacteria will be described.

#### ANTHRAX.

It seems probable that the eyelid is not an uncommon seat of the anthrax pustule, though for various reasons there are comparatively few cases in which the observa-

tions were confirmed by finding the bacillus; according to Pes<sup>20</sup> seven or eight.

In the first place the disease flourished before the importance of bacteriology was understood and the sanitary science of the present day has placed anthrax among the rare affections in civilized countries. A majority of the observations come from the Latin countries. They are often inaccessible in the original to the foreigner and but briefly abstracted in the reviews and the difference in nomenclature is considerable. Thus we have the following titles: "*Oedème malin*," "*Oedème malin ou charbonneux*," "*Pustule malin*," "*Charbon*," "*Anthrax*," and the like. Charbon refers more especially to the anthrax lesion, while anthrax represents the common carbuncle. From what we have already seen of the severity of lid infections, it seems probable that some of these cases were not true anthrax. Two undoubted cases were reported by Elschnig<sup>12</sup> in 1893; both patients recovered and the bacteriologic examination showed anthrax bacilli of low virulence. Rouxau<sup>57</sup> in 1886 reported a benign case. On the other hand, Dujardin<sup>58</sup> saw three-fourths of the upper lid become gangrenous in sixteen hours and Dubujadoux<sup>64</sup> reported two cases which came to autopsy. Among other observations are those of Debrou,<sup>59</sup> Pes.<sup>20</sup> Chevalier,<sup>60</sup> Deprés,<sup>61</sup> Socar<sup>62</sup> and Mauzevin.<sup>63</sup> In 1007 cases collected by W. Koch,<sup>65</sup> the eyelids were affected ten times. As is well known, the disease is usually transferred to man from diseased animals, either directly or indirectly, as in handling hides.

Contagion from man to man is rare, but occasionally does occur, as is shown in Elschnig's<sup>12</sup> case, where a woman contracted the disease from her husband. As a rule the organisms are carried to the eyelids by the hand and for inoculation some lesion in the continuity of the skin is necessary. In regions covered by thick skin it takes some time for the bacteria to reach the subcutaneous tissues; in the lids proper, however, this occurs rapidly and severe symptoms may set in with great rapidity. The organisms while in the skin form a thick network beneath the rete mucosum and cultures are easily secured. The incubation period is from one to three days, rarely longer.

The infection on the lids shows itself usually in the form of the anthrax pustule more rarely as the edematous form. The first sign is the formation of a papule,

later a vesicle forms which contains a brownish fluid. If this be not opened, it dries up and forms a scab. The surrounding skin is somewhat reddened, swollen and indurated. The affected area enlarges, gets darker in color and a black eschar is formed which may involve a large part of the skin of the lid extending from the orbital margin down to the ciliary border, which usually remains intact. Not infrequently, a circle of vesicles is formed around the eschar. The neighboring glands are generally involved. In this form severe complications are not uncommon.

The other variety of anthrax is characterized by edema and a more frequent general involvement. In its later course it resembles closely the carbuncular form, though first characterized by a diffuse, white edematous swelling affecting both lids and often involving the face to an enormous extent. Swelling of the glands and sometimes septicemia and death follow. In comparison to the anthrax of other parts of the body, that of the lids is relatively benign.

#### SQUAMOUS BLEPHARITIS.

The nature of this affection, which is also known as simple blepharitis or marginal blepharitis, is in doubt and will probably remain so for some time to come. Whether or not it is primarily due to bacterial infection is uncertain to say the least. Some authors regard it as an eczema, while others (Fuchs<sup>17</sup>) believe that it corresponds to scborrhea sicca, and the question of bacterial origin of both those diseases is still unsettled. Weeks<sup>66</sup> believes that there is an eczema of the lid border which resembles blepharitis marginalis and is due to the *Staphylococcus aureus* favored by a predisposition on the part of the patient. Sabouraud<sup>67</sup> states that simple blepharitis is probably an infection with one of the common, micro-organisms.

To determine the nature of the bacterial infection, if one exists, is no easy matter, for a large variety of micro-organisms have been found on the normal lid borders and occasionally they show a moderate degree of virulence. This was well shown by Cuénod,<sup>68</sup> who produced corneal abscesses in rabbits with cultures of the *Staphylococcus aureus* taken from the normal ciliary margins. Thus in every observation it is not only necessary to cultivate the micro-organisms but to test their virulence and even then no certain conclusions may be

drawn. Bayersdorfer<sup>69</sup> examined a number of cases of squamous blepharitis bacteriologically and obtained negative results. Cuénod,<sup>68</sup> in a series of thirty cases, found generally the *Staphylococcus albus*, often in pure culture; various other bacteria, mostly cocci, were obtained. Virulence tests performed with the *Staphylococcus albus* colonics on the corneæ of rabbits showed almost no virulence and it was only by the injection of various of the mixed cultures that he obtained severe lesions. He concludes:

D'une façon générale si nous comparons les cultures obtenus de bords ciliares normaux, et celles obtenues dans les cas de blépharite simple, nous notons en faveur de ces dernières leur abondance et leur extrême fertilité. Au point de vue de la virulence, elle ne nous a pas paru plus notable, et c'est là où la nature du terrain nous semble jouer un rôle supérieur à celui du microbe.

Winselmann,<sup>70</sup> speaking more especially of ulcerative blepharitis, believes that the first requisite for a blepharitis is hyperemia of the lid border to prepare the soil for the growth of bacteria. Roeder,<sup>71</sup> on the other hand, believes all blepharitis to be secondary to disease of the conjunctiva and of the tear sac. That a secondary tain origin which are occasionally seen.

blepharitis may occur in connection with an infection of the tear sac or the conjunctiva is a matter of daily observation. We can hardly go so far as to endorse Roeder's opinion. It is well established that the diplobacillus of Morax and Axenfeld has a special tendency to involve the lid margins and especially the angles; but this gives a very different picture from the ordinary squamous blepharitis. It seems probable, as Cuénod observes, that the nature of the soil plays a more important rôle than do bacteria.

#### ULCERATIVE BLEPHARITIS.

In a large majority of the cases of this disease the *Staphylococcus aureus* is the infecting agent; less frequently are other varieties of staphylococci met with. Widmark<sup>72</sup> found staphylococci in the small abscesses of the ciliary border, as did Gallenga.<sup>73</sup> In fourteen cases of ulcerative blepharitis Cuénod<sup>68</sup> found the *Staphylococcus aureus* eight times pure, the *Staphylococcus albus* four times pure, and twice found the two forms mixed. He proved the high virulence of all cultures containing the *S. aureus*, and obtained but little reaction from the *S. albus*.



Bayersdorfer,<sup>69</sup> in a series of cases, found the *S. aureus* always present and the *S. albus* also in about one-half the observations. Once he found the *Penicillium glaucum*, probably an accidental contamination. Herzog<sup>74</sup> obtained mostly staphylococci in his studies, but he was able to stain and to cultivate a diplococcus resembling the *Diplococcus albicans* which was found by Tommasoli in eczema, and a similar organism was described by Unna in a case of eczema secondary to pemphigus.

In a recent article McNab<sup>75</sup> asserts that a majority of cases of ulcerative blepharitis and that a vast majority of the long-standing chronic ones are due to infection with the diplobacillus of Morax and Axenfeld, that this organism may be found in the secretions of most cases and that a secondary infection of the follicles with pus organisms takes place. That an infection of long standing due to the diplobacillus may prepare the way for a secondary infection of the lid in a certain number of cases is not to be doubted. That a vast majority of the long-standing cases of ulcerative blepharitis rest on this basis can hardly be accepted, however, without sufficient proof, and McNab brings forward no evidence in support of his statements. So far as our knowledge goes at present, it is the staphylococci only that are concerned in the direct production of this disease. What part may be played by other organisms such as the diplobacillus and the xerosis group is for future investigation to decide.

Taking up now the classification and the various etilogic factors other than bacteria, we find a wide difference of opinion. Herzog,<sup>74</sup> Fuchs<sup>17</sup> and most of the text-books say that it is an eczematous process. Sabouraud<sup>67</sup> believes it to be a simple infection with pyogenic microbes in individuals who are subject to infection with pus organisms. The reason, therefore, we know little or nothing about. Some class it as acne, some as sycosis. Truc<sup>76</sup> and Roeder<sup>71</sup> believe it an infection always secondary to disease of the tear passages. Winselmann<sup>70</sup> believes that it is a primary disease of the ciliary roots induced by hyperemia.

According to Roeder, the mechanism is as follows: The normal tears, even if present in increased quantity, as in simple stenosis of the nasolachrimal duct, are prevented from penetrating into the hair follicles by the



sebum; let now an infection take place, be the microbial cause what it may, pus is formed and a fat emulsion is produced which overcomes the protecting products of the sebaceous glands and penetrates the follicles, producing irritation and infection. The tissues swell, the follicle becomes occluded, the pus collects, forms a cavity and later finds its way to the surface.

As the first requisite, Winselmann assumes a hyperemia of the lid border which may be due to many causes, such as dust, smoke, bad air, light, ametropia or serofulous constitution. This prepares the ground for the ever-present bacteria, and a primary infection of the roots of the cilia takes place. Thus the disease should be classed as a syeosis and is in no way related to eczema. Fuchs holds that it is an eczema which, owing to the presence of hair structures, suppurates as is common in eczema of other parts of the body where hair is present.

In his exhaustive article on the diseases of the cilia, Herzog<sup>74</sup> holds that the disease must be regarded as an eczema and that it develops in ocular conditions in which there is increased secretion of fluid. In beginning and course it can show all the characteristics of an acute infection. Particularly when it has existed a long time an inflammation of the follicles takes place regularly. Contrary to Unna's opinion, this is not to be regarded as a complication, but as a true eczematous involvement of the follicle. Herzog also holds that, in spite of the present inclination of dermatologists to exclude pustular affections of the epidermis from among the eczematous eruptions, the pustular folliculitis of the cilia follicle must be regarded as the summit of an eczematous process, and, although this process is not characteristic of the eczematous processes of the ordinary skin, it is logical and characteristic in this region. The micro-organisms penetrate along the hairs, find a more favorable soil here than in the epidermis and, therefore, have a more toxic action; they tend to remain in the follicles and thus the process often recurs and becomes chronic.

Such are the principal views of the present day.

#### HORDEOLUM.

The hordeolum is the furuncle of the ciliary border and differs in no way in its bacteriology from the furuncles of other parts. The classical description of hordeolum recognizes an external form, an inflamma-

tion of a gland of Zeiss, and an internal form or inflammation of one of the meibomian glands; the course and symptoms of the two varieties differing, as one would expect, from the very dissimilar anatomy of the two regions.

Axenfeld<sup>77</sup> demonstrated sections of hordeola in all four lids of a child, showing all stages of the process. The ciliary follicles were found full of cocci and showed surrounding necrosis varying in amount with the size of the swollen follicle; there was evidence of a severe sequestering inflammation which finally led to expulsion of the infected tissue and to the formation of an ulcer. On the lid border corresponding to the cilia follicle in depth were large furuncular abscesses. A point of especial interest, however, was the fact that the sweat glands occasionally formed the starting point of the process, since occurrence of furuncles of the sweat glands has been contested. From this case alone it must be allowed that the hordeolum externum can originate in the hair follicle, sebaceous gland or sweat gland. Thus Herzog<sup>74</sup> believes that the inflammation in some cases may simply be a step farther in ulcerative blepharitis, a more extensive infection leading to acute symptoms and abscess formation starting from a follicle already infected. That hordeoli are common in ulcerative blepharitis is well recognized and that furuncles of the lanugo hair frequently occur in its course he lays stress on.

Regarding the predisposing causes, blepharitis of greater or less intensity is naturally the commonest, and when that is lacking there must be some means of infection from without as in lesions of the lid border produced by removing forcibly the dried secretion of a conjunctivitis. In addition we have the causes of blepharitis mentioned before.

Hordeolum is very frequently designated as acne of the lid border. Acne is defined as an inflammation of a sebaceous gland. The infection of a hair follicle is termed sycosis and of a sweat gland as an hydradenitis. On the other hand, it has been shown that a furuncular (hordeolar) infection may start from any one of these three structures so that in these acute, localized infections of the lid border it would seem that hordeolum is the best name to use.

## TARSITIS NECROTICANS, ETC.

Under this title Mitvalsky<sup>78</sup> describes an inflammation starting in the meibomian glands and due to the ordinary pus organisms. Instead of following the course of the common hordeolum internum, this process extends and produces necrosis of the neighboring parts of the tarsus. A sequestrum is formed and extended through the inflamed conjunctiva. The necrosis seems confined to the breadth of two meibomian glands and may affect the whole vertical section of the tarsus. Maklakow<sup>79</sup> reports an inflammation of the meibomian glands with dilatation of their ducts and thickening of the tarsus in a patient who had had ozena for seven or eight years. In both the secretion of the nose and of the eye could an ozena bacillus be found which was pathogenic in the vitreous of a rabbit. Tarsadenitis meibomica, according to Weymann,<sup>80</sup> is a subacute or chronic infection of the meibomian glands, with a tendency to alterations in structure supposedly due to a diffusion of chalazial products throughout this region.

## CHALAZION.

Chalazion is a chronic inflammation of a meibomian gland with the formation of granulation tissue. Of its cause we know little or nothing as yet, although many investigators have tried hard to solve the problem of this little tumor. A number of different micro-organisms have been found in chalazia, among them many of the pus organisms, the *Bacillus xerosis* and rarely the Morax-Axenfeld diplobacillus, the *Bacillus pneumoniae* and the bacillus of tuberculosis.

The latter organism was seen under the microscope by Baumgarten,<sup>82</sup> Wichert<sup>83</sup> and Tangl,<sup>84</sup> and this gave rise to the doctrine that all chalazia were of tubercular origin. Numerous animal inoculations have been carried out, but always with a negative result, except in one case reported by Henke,<sup>85</sup> in which the material was taken from a child who died of tuberculosis. Nevertheless Baumgarten, Landwehr,<sup>86</sup> Wichert and others still affirm that chalazion is often tubercular. Most authorities agree that, while tuberculosis of the tarsus may rarely present a clinical resemblance, the true chalazion is an entirely different process.

Deyl,<sup>87</sup> in 1893, obtained from this growth a bacillus belonging to the xerosis group, and succeeded in pro-



ducing similar tumors by injecting large quantities of these organisms under the conjunctiva. It must be remembered, however, that xerosis bacilli may occur in the normal glands, and furthermore that in Deyl's experiments relatively enormous quantities of the germs were used.

Recently Bietti<sup>88</sup> has published the results of his researches. He succeeded in finding Deyl's bacillus in seven out of twenty chalazia. In four he found the *Staphylococcus albus*, in one the *S. albus* and pneumococcus mixed, in one the *S. aureus* and in seven the result was negative. He succeeded in producing experimental chalazia by injecting both living and dead cultures of both xerosis bacilli and also diphtheria bacilli, also when the animal was immunized with diphtheria antitoxin and when antitoxin was mixed with the cultures. He also got positive results on injecting the *Bacillus prodigiosus*, the rose yeast fungus, the pseudo-gonococcus, the *Staphylococcus albus* and others. He concludes that all these germs simply produce inflammation as would a foreign body and that no specific power in the production of chalazion can be attributed to the xerosis bacillus. Axenfeld<sup>81</sup> also observes that these bacilli are not constantly found, disappear early in the process and rarely show pathogenic action on guinea pigs. How closely bacteria are concerned with this process awaits future investigation.

#### TUBERCULOSIS.

In 1867 Langhans<sup>91</sup> inoculated tubercular material into the conjunctiva of a rabbit and produced general tuberculosis and death. In 1873 Koester<sup>92</sup> reported a tubercular granuloma of the conjunctiva. In 1879 Haab<sup>93</sup> reported thirteen observations, six personal, on the primary tuberculosis of the conjunctiva. This, however, was before the days of Koch's bacillus and probably the first exact observation of ocular tuberculosis was that of Parinaud<sup>94</sup> in 1884, who inoculated a rabbit with the scrapings from an ulcer of the tarsal conjunctiva with a positive result. Since then there have been a large number of observations, many of which have come from France. In 1903 Douvrie<sup>90</sup> in his inaugural thesis collected thirty-five cases of tuberculosis of the lids and from his article and from Groenouw's<sup>1</sup> compilation I have obtained a large amount of material. As, however, a

considerable number of the cases reported as tuberculosis of the lid affect only the conjunctival surface, they will be considered elsewhere.

The bacillus of tuberculosis may produce a large variety of lesions, owing in part to the varying virulence of the strain, to the anatomic peculiarities of the part affected and to local and general resistance. Lupus is the commonest form of tuberculosis of the eyelids and this is not peculiar in view of the fact that tuberculosis of the skin is not a rare affection and has its seat of election in the face. In an analysis of 374 cases by Bender<sup>96</sup> the face was involved in 287 and the nose in 70 more, thus it may be seen that the lids are affected secondarily with considerable frequency.

Primary lupus of the eyelids, however, must be considered uncommon. Block<sup>97</sup> observed it twice in 387 cases. On the face it presents no variation from lupus of the other regions of the skin, but appears first in the form of small, deep-seated brownish red macules of varying size or as small discrete nodules or infiltration of soft consistency situated in the corium. The disease develops slowly, new lesions form on the borders and an area or patch of varying size is developed. The individual nodules remain small, break down and form shallow ulcers with borders shading into red and brown with a scanty secretion and often crust formation. Cicatrization then takes place, the resulting scar being thick and tough and exhibiting a considerable degree of contraction. As the progress of the disease is slow all these forms may be seen within a comparatively small area. As the result of the process a considerable degree of ectropion is often left behind.

Lupus is by no means limited to the skin but may extend to the conjunctiva of the lids, globe and tear sac, it may involve the globe. Conversely it may originate in the conjunctiva and involve the skin and other structures of the lid secondarily. This is the second type to be considered. Even when the disease is confined to the conjunctiva of the tarsus the lid may appear swollen, thickened and may show a considerable degree of ptosis. Involvement of the tarsus may not take place, it may take place to a slight degree or it may be very extensive in amount and resemble syphilitic tarsitis as in the case recently reported by Rollet,<sup>98</sup> which is claimed to be a hitherto undescribed form of tuberculosis of the lid.



Certainly his case is a very marked example of this variety of the disease, but that occasional cases of diffuse involvement of the tarsus have been observed, is demonstrated by a case reported by Bach<sup>99</sup> in 1894. Not only may the tarsus be affected by the disease, but the whole thickness of the lid may be involved and ulceration may extend from the tarsal surface around the ciliary border. The symptoms and appearances vary with the extent of the disease, from slight thickening, edema and ptosis to a very considerable enlargement, an almost brawny induration with a marked degree of edema and redness of the skin, depending in part on how near the surface the disease has progressed. Occasionally, as we have seen before, tarsal tuberculosis may develop as a single focus, resembling a chalazion, or there may be multiple nodules situated in the muscle tissue as in Schmidt-Rimpler's<sup>100</sup> case. Occasionally there is a development of nodules resembling hordeola in the lid border (Braunschweig<sup>101</sup>) or a blepharitis (Gerin Roze<sup>102</sup>). Rarely a local tuberculous process, from direct inoculation, with abscess formation develops in the lids as in the other parts of the body. Such a process is well described by Stutzer.<sup>103</sup>

Capauner<sup>104</sup> described a lupus of the lid complicated by carcinoma and Ginsberg<sup>105</sup> remarks in this connection that in a chronic ulcerative process of this kind affecting the skin the histologic picture may be such as can not be distinguished from that of a beginning malignant growth. Another form is the cold abscess extending into the tissues of the lids and originating from tuberculosis of the neighboring bony structures (Galle-mærts<sup>111</sup>).

An atypical form as represented by Rollet's case published in Duvier's thesis must be mentioned. This was tuberculosis developing in the tissues of the lower lid and causing direct infection from the contents of a lacrimal sac which had been forcibly ruptured. The tumor was the size of a large sector cut out of a mandarin orange and was filled with pus and caseous material. The skin was of a purple color. One of the commonest accompaniments of tuberculosis of the lids and conjunctiva is enlargement of the neighboring glands, an important feature from the standpoint of diagnosis. The disease usually occurs between the fifth and thirtieth year of life, but occasionally is seen in those of more advanced years and also in the very young.

Sticker<sup>106</sup> believes that in skin tuberculosis infection takes place through the lymphatics from a primary lesion in the nose. Leloir<sup>107</sup> gives five possible routes for infection to follow. 1. Direct inoculation. 2. Indirect inoculation by continuity from deep foci. 3. By the lymphatics or veins passing through foci more or less remote. 4. Infection of hematogenic origin. 5. Infection by inheritance. The first two are probably the usual methods. As mentioned before, a number of the cases of lid tuberculosis are secondary to involvement of the conjunctiva and there is no doubt that this membrane may be affected primarily as by particles of dust containing bacilli lodging in the sulcus subtarsalis and abrading the delicate covering (Fuchs<sup>108</sup>). A number of cases are reported in which the primary lesion was supposed to be in this locality as no other tubercular process could be found. Moreover this is the most frequent seat of conjunctival tuberculosis though occasionally it is seen first in the fornix or bulbar conjunctiva, from which situations it may extend to the lids, lacrimal sac and nose. More frequently the converse is the case.

Tuberculosis may follow a wound of the skin as in Stutzer's<sup>103</sup> case, in which the patient was bitten in the upper lid by a dog. It may follow a simple trauma without any demonstrable surface lesion.

Sometimes infection of the ocular structures is secondary to the disease in distant parts. In Grunert's<sup>109</sup> case there was phthisis, in Gerin Roze's<sup>102</sup> phthisis and laryngitis, in Fontan's<sup>110</sup> case there was a tuberculosis of the bones of the lower extremity and dissemination followed a curettage. In Gallemaert's<sup>111</sup> case it followed scarlet fever, in Parinaud's<sup>94</sup> case it occurred during convalescence from typhoid.

Tuberculosis may remain localized in the lids and disappear without involving other parts, but, on the other hand, an ever present tendency to spread is shown by the very constant enlargement of the neighboring glands. In Cheney's<sup>112</sup> case (tuberculosis of the conjunctiva) a child of eleven years developed phthisis secondarily (?) and died. In Armaignac's<sup>113</sup> case phthisis and tuberculous laryngitis developed. It should be borne in mind, however, that both the complications and the ocular process may be secondary to some deep-seated undiscovered lesion.

## LEPROSY.

That the ocular structures form one of the commonest sites for the lesions of this disease is recognized by all observers. It is probable that they are affected in from two-thirds to three-quarters of cases (Groenouw<sup>114</sup>). According to Lopéz<sup>115</sup> lesions will be found at some period of the disease in every case.

In an analysis of 480 cases Borthen<sup>116</sup> found the eyes and adnexa affected in 80 per cent., in 87 per cent. among men and in 74 per cent. among women. Profeta<sup>117</sup> puts the figures at 86 per cent. Boeckmann<sup>118</sup> in 62 fresh cases, 64 per cent., in 63 old cases, 75 per cent. The tubercular form preponderates; among 219 cases Borthen found 95 per cent. affected. In the macular anesthetic type Boeckmann found the ocular structures involved in 66 per cent. of 237 cases. In both forms the men were more often affected than were the women. In the mixed type Boeckmann saw 83 per cent. of cases, Kaurin,<sup>119</sup> 57 per cent. The eyebrows themselves are affected in about half the macular anesthetic cases and in practically all the tubercular.

Some writers describe three original forms of the disease, macular, tubercular and anesthetic, and all add a mixed type. In any case the different varieties usually shade into each other to a greater or less degree. The macular-anesthetic form is characterized by the development of reddish-brown hyperesthetic patches which later turn yellow and anesthetic; they may be accompanied by definite infiltrations. Later atrophy of the skin and of the deeper structures, the tarsus and the orbicularis may almost entirely disappear. Thus entropion and lagophthalmus are characteristic, due, in part, to the atrophy and sometimes to the involvement of the terminal filaments of the facial nerve (Lopez,<sup>115</sup> Bistis<sup>120</sup>). Bistis mentions a case in which one side of the face was completely paralyzed.

It may be mentioned here, though digressing somewhat, that Borthen<sup>121</sup> points out a fundamental difference in the relationship of the two forms to the ocular involvement. In the macular type the bulbar involvement is often secondary (ectropion, lagophthalmus and their results) and, therefore, not a genuine leprosy, while in the tubercular type, as long as it has not reached the anesthetic stage, the bulbar affections are, so to speak,



independent, that is a true invasion of the *Bacillus lepræ*.

The tubercular variety is characterized by the development of small brownish nodules with a shining surface, generally appearing first in the region of the eyebrows and later in the lids proper. In the lid border they may also develop and resemble little chalazia. The nodules become confluent and may reach such a size that almost complete ptosis results. A more common appearance, however, is the knotty, furrowed, projecting eyebrow. The nodules are divided and crossed by furrows, and the lid region may be cut into two equal halves by the fibers of the corrugator. Ectasia (Jeanselme and Morax<sup>122</sup>) of the superficial veins may take place and ulceration also in both forms with absorption of the nodules and the formation of scars. The hairs are early and markedly affected in both types, the disease usually beginning in the outer half of the eyebrows and later extending to the lashes. The hairs sicken and fall out, giving a characteristic appearance as the hair of the scalp is not affected. Ectropion is common, distichiasis is sometimes seen, while ectropion occurs rarely, according to Lopez<sup>115</sup> and Bistis.<sup>120</sup> The course of the disease extends over many years.

Leprosy occurs most frequently between the ages of 30 and 50. Our knowledge of the incubation period is indefinite, but it seems to be very variable, from several months to many years. The site of inoculation is not known; according to Sticker,<sup>123</sup> the primary lesion is almost always an ulceration in the cartilaginous septum of the nose. Out of 153 cases he found this process in all but 13, and in 9 of these the nasal secretions contained many *Bacilli lepræ*. Geill<sup>124</sup> has called attention to the fact that among barefooted people in the Dutch East Indies the first signs of the disease were observed on the feet in 50 per cent. of the cases.

General dissemination of the disease takes place in all probability by means of the lymphatics, occasionally through the blood current. The means of contagion from one individual to another are not known; possibly there is an intermediate host. Intimate contact seems to be necessary. *Bacillus lepræ* was discovered by Hansen in 1871, but up to the present time cultures and inoculations have not given satisfactory results. The micro-organisms occur in clumps or groups. Virchow,<sup>126</sup>

Neisser<sup>126</sup> and many others believe that they occur within the large cells so characteristic of this disease, while Unna<sup>127</sup> and Herman<sup>125</sup> maintain that for the most part they lie free in the lymph spaces and vessels, blood vessels and connective tissue. They are found also in the walls of vessels, in the nerve sheaths, in the rete mucosum of the skin and particularly around the hair follicles. Leprosy tubercles consist of an infiltration made up largely of leucocytes and to a lesser degree of cells which have arisen from proliferation of the fixed connective tissue cells. A vessel is generally found in the center of the nodule (Ginsberg<sup>128</sup>).

#### GLANDERS.

Before the days of bacteriology Krajewski<sup>130</sup> described the case of a child who developed an ulceration on the right lower lid and a small hard nodule, which later necrosed and became gangrenous, on the left upper lid. There was enlargement of the neighboring glands, fever and delirium. The child was supposed to have contracted the disease from a horse affected with the lesions of glanders. In Neisser's<sup>131</sup> case there was an ulcer of the lower lid near the inner canthus, also abscesses and ulcers on other parts of the body. Tarnowski<sup>132</sup> saw pustules forming on the lid and elsewhere in a patient who had been infected by a bite on the arm. Gourfein<sup>134</sup> saw a slight ectropion following extensive loss of substance on the cheek and in the neighborhood of the tear sac due to glanders. Tedeschi<sup>133</sup> was able to produce the lesions of glanders on the lids of guinea-pigs by injection of the bacillus into the anterior chamber. Extensive involvement of the upper lid took place with destruction of the tarsus and ulceration. Thus the lesions of glands are rarely found in connection with the ocular structures and on the lids show no peculiarities of importance.

#### TETANUS.

Fromaget<sup>135</sup> has collected a large number of cases in which infection of the ocular structures by Nicolaier's bacillus has produced typical tetanus. Occasionally a wound of the eyeball itself has been the starting point, but in most cases entrance has been through a lesion in the lids, and, as would be expected from its exposed position, the orbital border is the commonest site of involvement.



The injuries have been of all descriptions from small surgical incisions to extensive lacerating traumatism. but, as is usually the case in tetanus, the comparatively insignificant wounds have predominated. Out of some eighteen or twenty cases there were several cases of the so-called cephalic type. In tetanus there can be an involvement of the musculature of the lids showing itself in spasm or paralysis of the orbicularis and paresis or paralysis of the levator palpebræ. In the literature section will be found references to a number of the cases.

#### ALEPPO BOIL.

This is a local infection of the skin endemic in certain tropical regions and known also as Delhi sore, Biskra button, Orientbeule (Ger.). All parts not covered by the clothing are affected, among them the lids. The disease begins as a red macule and steadily grows to form an elevated indurated area which may reach the size of a walnut. Ulceration takes place and later cicatrization. Various French observers have attributed the infection to a diplococcus, but more recent investigation by Wright,<sup>153</sup> confirming and amplifying the studies of Cunningham, Riehl and Firth, shows that it is more probably due to a protozoa. Willemin<sup>154</sup> has given a description of two cases in which the lids were affected and mentions hearing of a case in which the eye was destroyed by the disease.

#### BUBONIC PLAGUE.

Calmette and Salimbeni,<sup>158</sup> in their observations on the Oporto epidemic, mention that pustules have been found on all parts of the body in this disease, and in one of their cases the conjunctiva was affected.

#### BOTRYOMYCOSIS.

Ten Siethoff<sup>159</sup> records the following observation: The patient was a man who had been tending a horse affected with a fistula of the spermatic cord of botryomycotic origin. There was swelling of the lid border and the formation of nodules 0.5 to 3 mm. in diameter which resembled actinomycosis. On pressure an opaque glistening material containing typical colonies of the botryococcus could be expressed. The disease is occasionally seen in man and the cornea is rarely affected (Bargeton<sup>160</sup>). It is caused by a coccus resembling the *Staphylococcus aureus*, of which it may be a variety.

## RHINOSCLEROMA.

This is a disease starting from the mucous membrane of the nose and characterized by the formation of hard nodular masses composed of granulomatous tissue. An encapsulated bacillus, *Bacillus rhinoscleromatis*, resembling the pneumococcus, is found in the lesions. The tear sac is not uncommonly involved, and from this situation extension to the lids, orbit and eyeball may take place. In Zeissl's<sup>161</sup> case the skin of the lid and of the ciliary border were involved, in Sehultess'<sup>162</sup> case the inner part of the upper lid and the inner wall of the orbit were affected.

## CYSTICERCUS CELLULOSÆ.

The cysticercus occurs rarely in the lids in comparison with the frequency with which it is found within the eyeball. I have been able to find but ten cases in the literature. The first observation was that of J. Siehel<sup>165</sup> in 1847. Canton<sup>166</sup> added a case in 1855 and Dolbear one in 1861. Four cases have been seen by Hirschberg,<sup>169</sup> who gave an historical résumé of the subject in 1892. Two other cases have been reported by Bull<sup>170</sup> and Streatfield.<sup>171</sup> It appears as a small, round, hard, elastic tumor either under the skin of the lids proper, or along the orbital border. On account of the thickness of the capsule it is non-fluctuant and the overlying skin is not attached, but freely movable. In size it varies between that of a pea and a small nut, depending somewhat on the character of the tissue in which it develops. The surface is smooth and it is not tender on pressure. In the case of A. Siehel and Gros<sup>168</sup> there were attacks of severe pain supposedly due to pressure on the supraorbital nerve, but the report does not state whether this symptom was relieved by the excision of the growth. In old cases tenderness and irritation of the skin sometimes develop. As is well known the cysticercus gains an entrance into the circulation from the digestive tract and may be carried to any part of the body.

## PEDICULOSIS.

This affection of the eyebrows and eyelashes, also known as phthiriasis, can hardly be regarded as a modern discovery, since it was known to Celsus and to Galen (Kraemer<sup>175</sup>) and since scattered observations concerning it have come down to us for two thousand years. Even in the immediate past it has been regarded

as of rare occurrence. Hirschberg<sup>175</sup> saw but three cases among thirty thousand patients, Galezowski but two among his very large material, Schwenk nineteen among 19,819 at the Wills Eye Hospital in Philadelphia. Jullien<sup>172</sup> puts it at one in one thousand, and this is probably a fair estimate.

Cases have been reported in this country by Chisolm, Winfield, Hansell, Hooper, Stelwagon and others. Chisolm,<sup>174</sup> in 1891, at the Eye, Ear and Throat Hospital in Baltimore saw thirteen cases, and remarks that one or more cases are treated there each year. At the Massachusetts Charitable Eye and Ear Infirmary the condition is seen occasionally.

Kraemer<sup>173</sup> also believes that it is not so rare as figures tend to show, for it may not be recognized and is chiefly confounded with other affections of the lid border. The *Jahresbericht* for 1892 alone refers to eight articles on this subject.

Pediculosis of the lids is principally seen among those of dirty habits, but is occasionally observed among patients of the better class (Hirschberg,<sup>175</sup> Chisolm<sup>174</sup>). The pediculus pubis is the variety met with in almost all cases, for the pediculus capitis very rarely occurs in this situation. For some reason children form a very large percentage of the cases reported, although in them the natural habitat of vermin is undeveloped. Occasionally several members of the same family are affected. Infection takes place by extension from one part to another or from one person to another. Pediculi in the pubic region migrate to the lids and very rarely to the scalp.

The symptoms vary with the number of the parasites, from none at all to considerable itching, smarting and discomfort. In appearance there may be little to suggest the nature of the process, or there may be a condition simulating a blepharitis of the squamous or mild ulcerative type with small crusts or scales and little ulcers. The louse is of a dirty brown color and resembles a small scab; it adheres to the base of the cilia, and the head may be buried in the follicle. The nits are more conspicuous and give a nodular appearance to the lashes.

A feature of diagnostic importance is the presence on the lower lids of small reddish or brownish specks, the excreta, compared in appearance to specks of iron



rust. The excreta are of an irritating character and often cause the ocular irritation seen in connection with pediculosis capitis. There are but two observations on the actual occurrence of this latter form on the lids. These comprise three cases, two reported by Bock<sup>177</sup> in 1892 in which the lice were present on the hair and eyelashes and not on the eyebrows. The other case was reported by Amman<sup>178</sup> in 1897. Both of these authors described the lid edges as being of a gray or yellow color, and Bock states that it was unlike the dirty gray tint characteristic of pubic lice.

#### DEMODEX FOLLICULORUM.

This microscopic parasite, which is also known as *acarus folliculorum*, was discovered in the ceruminous glands by Henle in 1841 and in the sebaceous glands by Simon in 1842 and later in the hair follicles. In 1876 Michel discovered it in a lanugo hair follicle on the lid, in 1879 Majocchi<sup>179</sup> found it in the meibomian glands and also in the follicles of the cilia, where Stieda<sup>180</sup> also observed it in 1890, Burchardt<sup>182</sup> also found it in a chalazion. For a long time it was thought to be harmless, but now there is evidence to show that it may produce an abnormal pigmentation of the skin (de Amicis,<sup>181</sup> Dubreuilh) and that it or a closely allied organism produces a severe and sometimes fatal disease in dogs.

Raehlmann,<sup>183</sup> in 1890, ascribed to it a form of blepharitis (blepharitis acarica) characterized by diffuse hyperemia above the cilia, a slight swelling of the anterior lid margin and with a thick, yellow, honey-like secretion. Raehlmann and Reinhard found the demodex in only 1 per cent. of healthy lids and not at all in squamous and ulcerative blepharitis. His views have met with a considerable amount of discussion. Majocchi believes that this form of blepharitis is not a disease *sui generis*, but that it is dependent on some other process as a conjunctivitis. He states, however, that the demodex may cause hyperkeratosis, hyperplasia of the follicle sheaths and a perifolliculitis. Joers<sup>184</sup> examined fifty patients chosen at random and found acari in 64 per cent. He concludes that they are less frequent in disease and are not pathogenic. Hunsche<sup>185</sup> agrees with Joers.

Mademoiselle Stcherbatschoff<sup>186</sup> found these organisms in the cilia of about 50 per cent. cadavers, also

seventeen times in the examination of 100 cilia from cases of blepharitis, but only once in 81 healthy lids. Thus the pathogenicity of these little organisms can hardly be regarded as proved; that it can cause some injury to the hairs and a pigmentation of the skin seems possible.

#### INSECTS, ETC.

Principally through the observations of Carron de Villards<sup>10</sup> in the tropics do we know that a large variety of insects and the like may cause numerous affections of the lids through carrying extraneous infectious material or by the toxic substances which they themselves possess. The list includes various kinds of flies and mosquitoes, moths of several varieties, the brown tail is known to many of us here, bedbugs, woodticks, spiders, scorpions, lecches and many more. The lesions caused vary in severity from a mild erythema to severe infections and death.

#### RINGWORM.

Involvement of the eyebrows and lid skin in ringworm (*Tinea trichophytina*) is probably not a very rare occurrence, though there are comparatively few allusions to it in literature. On the other hand, the cilia are but rarely affected and no case has as yet been reported in which the ciliary border has alone been involved. Cartaz,<sup>187</sup> in 1869, reported a case which in all probability was ringworm of the lashes, and Gailleton,<sup>188</sup> in 1889, added a single case. In 1894 Mibelli<sup>189</sup> published an important article on the subject, giving two cases of his own, quoting one seen by Pellizari and three seen by Majocchi in one of which the cilia was undoubtedly affected. Mibelli came to the conclusion that these four cases were the only authentic ones up to that time. Since then four have been added, those of Niclos<sup>190</sup> (1895), Dubreuilh<sup>191</sup> (1896), Voerner<sup>192</sup> (1901) and Snell<sup>193</sup> (1902). Voerner's study of the subject is fairly complete, and his case seems to be the only one confirmed by culture.

Formerly the ringworm was thought to be due to one fungus, the trichophyton, but during the last decade and owing chiefly to the indefatigable investigations of Sabouraud it has been shown that there are two divisions of ringworm fungi, first the microsporon of Audouin and, second, the trichophyton or megalosporon,



which can be further subdivided and about which there is still much to investigate. Both of these forms occur in connection with eyelids, or both are composed of mycelium and spores. The disease is conveyed through the establishment of the fungus in the horny layers of the skin. Growth into the hair follicles takes place, subcorneal or intracorneal vesicles filled with serous or serofibrinous exudate are formed and the hair shaft proper may or may not be involved. The subcutaneous tissue is invaded by plasma and lymphoid cells and there may be a proliferation of the fixed cells. Suppuration may and frequently does occur. Both the upper and the lower lids have been affected. In those cases in which the ciliary border is involved the process at first sight may resemble an ordinary squamous or ulcerative blepharitis, but more careful observation will often show distinctive features, such as the formation of inflammatory foci of considerable extent, the rapid extension to neighboring cilia and the acute course of the disease. There is always redness and swelling, pustular points are not uncommon, and the cilia are broken and considerably distorted. The occurrence of lesions in other parts helps to establish the diagnosis.

#### FAVUS.

In favus of the lids (*Tinea favosa*), we have another comparatively rare affection. Up to 1885 only four cases had been reported, but during the past seven or eight years there have been a number.

That the lids are not infrequently involved in favus universalis seems not improbable. I have made no extensive search to verify this statement, but in the recent article of Paulus<sup>194</sup> there are two such cases.

In a number of cases of sycosis of the lid border<sup>195</sup> Ellinger found a fungus resembling the *Achorion schoenleinii*, and Gunning made a similar observation in 1865. The identity of this organism with that of favus, however, has been doubted by later writers.

Narkiewicz-Jodko<sup>196</sup> reported a case of lid involvement in 1870. Arcolco,<sup>197</sup> in 1872, in a case of favus capitis, found spores and mycelia on the eyelids. Schiess-Gemus<sup>198</sup> added a case in 1873 and McHardy<sup>199</sup> one in 1885. More recently the list has been enlarged by the additions of Sherwell,<sup>200</sup> Dervill,<sup>202</sup> Cuénod,<sup>201</sup> Pergens,<sup>203</sup> Libman,<sup>205</sup> Gloor,<sup>204</sup> Schmidt-

Rimpler<sup>206</sup> (two), Van der Wijk,<sup>207</sup> Collins<sup>208</sup> and Pecoraro.<sup>209</sup> One of the most recent articles on the subject is that of Pecoraro in which a résumé of the cases and of the literature is given.

Favus is due to the achorion, discovered by Sehoenlein in 1839, a vegetable parasite composed of mycelia and spores. According to Crocker,<sup>210</sup> five varieties of the fungus have been described, but it is doubtful if any but the one above mentioned is concerned in the production of favus.

The disease is more likely to occur among persons of low vitality and dirty habits, and there is possibly an individual peculiarity of the skin in those affected. It may be communicated from one person to another or to man from the lower animals, particularly the cat. In order to produce the disease the parasite must be established in the epidermis, which in the case of the constantly moving lid is a difficult matter. Pecoraro<sup>209</sup> believes that this may account for the relative infrequency of lid involvement. According to Robinson, the parasite lodges first at the opening of a hair follicle and grows down into about half way to the root; in the skin it vegetates superficially and only seldom penetrates into the deeper layers. The first noticeable sign is a reddish and slightly scaly spot, insignificant in character, next yellowish crusts appear around the lanugo hair follicles and grow to the size of a pea, showing a cup-shaped depression in the center (the scutulum). If these crusts be removed they show a reddish underlying surface. The crusts become confluent and form masses occasionally traversed by concentric furrows. The hairs are involved early, become brittle and break off. The upper lid is more often affected than the lower and generally the ciliary border is not involved. In the report of Collins<sup>208</sup> case will be found a colored plate showing the appearance of the disease on the lid.

#### BLASTOMYCOSIS.

The organisms which cause this disease may be tentatively classed under the name of oidium (Link) and are a genus of the yeast family (*Oidiomycosis cutis*). The *Oidium albicans* was the first of these organisms to excite medical interest as far back as 1840, when it was recognized as the cause of parasitic stomatitis. Busse, under the title of "Saccharomycosis hominis," pub-

lished in 1894 an account of a case of pyemia caused by a pathogenic yeast.

Curtis, in 1896, described a case of myxomatous-like tumors caused by a yeast-like organism. Gilchrist, in 1896, was the first to describe a skin disease due to a yeast-like organism, naming the disease "blastomyeetic dermatitis." In his second case the skin of the eyelids was affected. Ricketts<sup>212</sup> concludes that the protozoic disease of Posadas, Wernicke and others, saccharomyeosis and blastomyeetic dermatitis, are various manifestations of the same disease. Since that time over forty cases of cutaneous blastomyeosis have been reported, and in at least ten the skin of the lids has been affected. Thus the eyelids must be regarded as a favorite seat of the disease.

Pusey believes that 50 per cent. of the cases show lesions of the lids, and that in most of these the disease is primary there. A very large majority of the cases have occurred in the vicinity of Chicago. The most notable recent general consideration of the subject is that of Ricketts,<sup>212</sup> while the ophthalmic side of the disease is well treated in the articles of Montgomery,<sup>213</sup> Wood<sup>214</sup> and Wilder.<sup>215</sup> Rosenstein,<sup>216</sup> in 1904, reported an ulcer of the lower lid, in which he found a pure infection with yeast organisms. He regarded the case as unique, but was evidently unacquainted with the observations on blastomyeosis.

The blastomyeetes appear as rounded, doubly-contoured, vacuolated bodies, often seen in pairs and also as budding forms. In cultures they show mycelia, but not in the tissues. They produce a large amount of epithelial hyperplasia and form small abscesses in the epithelium and granulation tissue studded with small abscesses in the corium.

Infection is probably always due to the implantation of oidium spores on a surface from which the surface epithelium has been removed. The initial lesion starts as a small papule which soon becomes covered with a crust. It spreads gradually and appears as a flat, deep red, warty, slightly elevated growth, containing many small abscesses and showing but little tendency to ulcerate. The purulent contents of the abscess contain the organism. As the disease progresses, healing of the part originally affected may take place, the resulting scar being soft, smooth and rather flexible.

## ACTINOMYCOSIS.

Actinomycosis of the jaw affecting the soft parts of the face may cause a considerable swelling of the lids. There is no observation, however, of the disease having its primary seat in the palpebral structures. Partsch<sup>217</sup> reports a case in which the upper jaw became involved probably from a carious tooth. Swelling of the lids followed and a small nodule appeared on the upper one, which, when excised, showed a typical actinomycosis. Darier and Gautier<sup>218</sup> observed in a patient an indurated swelling of the right cheek attached to the superior maxilla. The lower lid, especially its outer half, was the seat of a soft edematous infiltration, and the skin was of a pale reddish color. Here also actinomycosis was found.

In 1887 Fienzal<sup>220</sup> described an ulcer, situated near the border of the lower lid, which had a yellowish surface and sharp borders. Around its border pustules developed slowly. There was considerable pain and a swelling of the preauricular gland. From both the ulcer and the pustules a fungus was obtained, but its nature was not determined.

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PRESS OF THE AMERICAN MEDICAL ASSOCIATION,  
ONE HUNDRED AND THREE DEARBORN AVENUE,  
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